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REPORTS ON THE SCIENTIFIC RESULTS OF AN  
EXPEDITION TO THE SOUTHWESTERN HIGHLANDS  
OF TANGANYIKA TERRITORY

I

INTRODUCTION AND ZOÖGEOGRAPHY

BY ARTHUR LOVERIDGE

WITH THREE PLATES

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No. 1.— *Reports on the Scientific Results of an Expedition to  
the Southwestern Highlands of Tanganyika Territory*

I

*Introduction and Zoögeography*

BY ARTHUR LOVERIDGE

The following remarks are intended to serve as an introduction to the series of reports which have been prepared on collections made by the writer during an eight months' *safari* in East Africa on behalf of the Museum of Comparative Zoölogy.<sup>1</sup>

There is much invertebrate material still awaiting study and on which it is hoped that further reports will appear. The mollusca are being utilized by Dr. Joseph Bequaert and W. J. Clench for their revisionary work on the genera of African land and freshwater shells. The paper on nematodes deals with only a portion of the parasitic worms collected. In addition to these invertebrates, and seven thousand, four hundred and eleven vertebrates, about half a ton of ethnological specimens were purchased, labeled and brought back for the Peabody Museum of Harvard University. The personnel of the expedition consisted of the writer and three native assistants, whom he had previously trained in the preservation of mammals, birds and reptiles.

OBJECTIVE OF THE EXPEDITION

The purpose of the journey might be said to be threefold. The primary object was to add to our very scanty knowledge of the herpetological fauna of the chain of mountains in Tanganyika Territory, commonly referred to as the southern and southwestern highlands, with a view to throwing light on the composition of the unusually interesting fauna occurring in the Uluguru Mountains of East Central Tanganyika.

As a secondary consideration special attention was to be paid to the zoölogically little known range flanking the eastern shore of Lake Nyasa and known to cartographers as the Livingstone Mountains. To the local inhabitants, however, this name is utterly unknown; they refer to its various sections by the name of the inhabiting tribe, thus the northern portion is called the Ukinga Mountains as the Wakinga dwell there.

<sup>1</sup>This expedition would have been impossible without a grant of half the expenses from the Carnegie Institution of Washington, the sum involved originally voted by the Carnegie Corporation of New York. It is a great pleasure to tender our grateful thanks and acknowledgements to these institutions and their presiding officers, Dr. John C. Merriam and Dr. F. P. Keppel. (T. Barbour, Director.)

It seemed a pity to proceed on so expensive a *safari*, costly because so far removed from the railway and easy communication with the coast, without taking advantage of the opportunity to secure certain species still lacking in the collections of the Museum of Comparative Zoölogy; particularly species of uncertain taxonomic status whose position would be more firmly established if adequate topotypic series composed of both sexes could be secured. With this object in view a return itinerary was planned which would embrace certain type localities. This then formed the third motive of the trip.

Perhaps it would have been better to have attempted less. So great an area had to be covered, occasionally by such primitive methods of travel as walking, that inadequate time — in some instances only two days — had to be allowed in which to collect topotypes of such elusive genera as *Typhlops*, *Leptotyphlops*, and *Amphisbaenula*. At the same time a certain measure of success attended these efforts and topotypes of a large number of species unrepresented in any American museum were secured.

As to the second objective referred to above, *viz.* a zoölogical reconnaissance of the whole of the Livingstone Mountains, I failed, for only three weeks were spent in the range and all of these were in the temperate rain forest section surrounding Madehani at the northern end of Lake Nyasa. My reasons for abandoning a thorough examination of the range were numerous. After a couple of short journeys southwards along the range I came to the conclusion that anything like a comprehensive study of the fauna would be impracticable in the time at my disposal. The steepness of the mountain sides to be negotiated and the wearisome detours necessitated by some physiological feature were such that in a day's march porters could not cover much more than five miles as the crow flies. Probably a straightforward march down the centre of the range would occupy between one and two months. Anyone attempting a zoölogical survey of the Livingstones should be prepared to devote at least six months to the undertaking. Judging by the number of new forms found at Madehani, a thorough investigation would be productive of new races or species, but these would be more likely among the mammals and birds than among the reptiles.

The fauna is not rich and is unlikely to differ in any important respect from that of the adjacent Ubena Highlands through which we passed, or on the other hand from that of the Shiré Highlands and Nyasaland Plateau into which it merges. Such parts as I saw were subjected to intensive cultivation, the valleys and hilltops were in



places quite thickly populated. The Wakinga are exceptionally industrious and grow European wheat so successfully that natives from all the surrounding country, even a hundred miles away, proceed to Ukinga to purchase flour. Most of the uncultivated ground was rolling grassland over which flocks of cattle and goats wandered in charge of little goatherds who were unhampered by clothing. Missionaries, whose work took them on itineraries in the mountains, as well as the Forest Officer at Tukuyu, informed me that there were no areas of primary forest left except those in the vicinity of Madehani where I camped.

The southwestern and southern highlands from Rungwe east to the north end of Lake Nyasa and northeast to Iringa, have a mean altitude of about 4,000 feet, though Rungwe Volcano itself rises to 9,850 feet and the highest peaks of the Ukinga Mountains are 9,600 feet.

Except for their lower altitude and less precipitous slopes, the highlands south of Iringa are not greatly dissimilar from parts of the Ukinga Mountains. They consist of a pleasantly undulating hilly country though in places steep-sided hills occur and the whole plateau is bounded in parts by lofty escarpments. The undulating country is largely grassland where the Wahehe graze their herds; the steeper hills are often clothed in dense scrub and bush of secondary growth while surviving patches of virgin forest are rare and widely scattered. This latter feature distinguishes them from the greater areas of rich primary forest occurring on Rungwe and the Ukinga range.

It is more than a coincidence that the heavily forested areas are those possessing the greatest rainfall; thus the mean rainfall at Iringa, based on records of a period of eleven years, is 26.57 inches; that of Tukuyu, lying near the foot of Rungwe Volcano, is 91.51 inches, this figure being the mean for seventeen years. This is the greatest rainfall for any part of the Territory and may in part be attributed to Tukuyu being situated between the great lakes of Nyasa and Tanganyika, whose heavy evaporation under a tropical sun is precipitated by the adjacent forested peaks. It is interesting to note that the next highest rainfall records are from Amani in the tropical rain forests of the Eastern Usambara range where the records kept for a period of eighteen years give an average of 80.09 inches per annum.

No figures are available for the Uluguru Mountains lying south of the Usambara and northwest of Iringa but they are not likely to be far short of the Amani average. The Uluguru support a similar forest to the Usambara, and are important as being the most southerly

area of tropical rain forest of any extent. This forest is readily distinguishable from the temperate rain forest of the mountains to the south. The highest peak of the extensive Uluguru massif reaches 8,000 feet. On their northern aspect these mountains rise relatively steeply from the plains, but to the south they pass gradually into hilly country not unlike that of the Iringa Highlands.

#### ITINERARY

The following detailed information concerning the camps at which collecting was carried on, has been arranged in the order of the itinerary; the same arrangement has been observed in the listing of the material in the systematic reports dealing with the specimens collected.

After the name of the locality, the approximate altitude of the camp is given, followed by more precise data as to the position of the camp and the period during which collecting was carried out in the vicinity. This is intended to serve as a check to the dates on the labels accompanying each specimen in case the figures become defaced or illegible with the passage of time.

The climatic conditions are of such outstanding importance in the collecting of lower vertebrates that the meteorological aspect of each camp during our stay is given in detail.

Mention is then made of some characteristic forms or rare species to enable a taxonomist to visualize the faunistic features of the neighborhood.

In the systematic papers dealing with the terrestrial vertebrates, the local names applied by the various tribes to the creatures taken in their vicinity, have been inserted. To be confident of absolute accuracy in regard to such names one really should live among the particular tribe for many years; this not being possible I have endeavoured to take reasonable precautions to secure accuracy but it is not to be expected that some errors will not have crept in. Every native is not a zoölogist but every native in his desire to be obliging is apt to call an animal by the name he thinks most applicable, if he should be unfamiliar with the correct one. To avoid such errors, specimens were submitted to groups of natives who argued or discussed alternative names before submitting the final opinion to me. For example, at the conclusion of my stay at Madehani, the whole congregation visited my camp at the end of the morning church service and were shown an example of each species taken in the neighborhood. At Iloilo, through the exceeding kindness of Herr Gemusens, I was

able to exhibit representative specimens of the Ilolo and Rungwe collections to the whole school of the Moravian Mission and had the additional advantage of Herr Gemusen's own unrivalled knowledge of the Kinyakusa tongue.

When a species has been recorded previously from any of the localities visited during the course of the trip, this fact is entered under the heading *Distribution*, together with the name of the author who recorded it.

*Dar es Salaam, Dar es Salaam District, Usaramo.* Alt. 100 feet.

The capital and chief port of entry of Tanganyika Territory.

In hotel November 4th to 7th and 18th to 19th, 1929.

A little rain fell.

My time being fully occupied in unpacking crates and repacking their contents into safari boxes of portable size, getting licenses, etc., I made no attempt at collecting. Salimu, however, was sent to get large series of *Lygodactylus p. picturatus* and *Cryptoblepharus b. africanus*, in which he was successful.

On our return from Bagamoyo we reached Dar es Salaam at 3.30 p.m. and left at 11.30 next morning having railed all equipment in the interval.

*Bagamoyo, Bagamoyo District.* Alt. 100 feet.

Situated on the east coast opposite Zanzibar and forty miles north of Dar es Salaam.

Camped from November 8th to 18th, 1929.

During the last week of October two heavy showers had occurred and each morning from the 10th to the 14th one or two rainstorms swept the town but quickly passed so that an hour or two later it was difficult to believe that rain had fallen, so rapidly was it absorbed by the hot dry sand.

In consequence of this aridity the only spots which rewarded the digger were at the base of bananas in the native gardens a little further inland. These plants seem unable to flourish at Bagamoyo unless planted in a pit. Half-a-dozen such pits were examined and yielded *Hemisus m. marmoratum* squatting upon its eggs or tadpoles in the moist soil at the base of the bananas. Several *Typhlops s. mucruso* were secured in this type of environment.

Following the Ngeringeri road after it crosses the Ruvu River, one reaches open woodland about three miles on the far side of the ferry. It was here that most of the bird collecting was done and a *Pachyoccyx validus* shot. Parrots, plantain-eaters and hornbills occur, though they were not abundant; on the other hand several species of bee-eaters were very common.

Bagamoyo is type locality for *Leptotyphlops braueri* (Sternfeld), *Rhampholeon boettgeri* and *Hylambates argenteus* of Pfeffer; it was in the hope of securing topotypic series of these that Bagamoyo was visited, but without success.

*Morogoro, Morogoro District, Ukami. Alt. 1,628 feet.*

A station on the Central Railway of Tanganyika, 126 miles west of Dar es Salaam. Principal town of the Ukami country situated at the foot of the Uluguru Mountains.

In hotel November 20th, 1929.

Only a shower or two had fallen during the month and everything was very parched and dry. It was the more surprising therefore to secure close to the station and with little difficulty a topotypic series of *Megalixalus loveridgii* (syn. of *M. fornasinii*) including a number of young specimens.

A couple of hours spent in turning logs, stones and debris gave no results though in digging at the base of a banana a queen soldier ant or *siafu* (*Dorylus helvolus*) was unearthed much to the annoyance of the myriads of workers and warriors. Dr. W. Morton Wheeler, who kindly made the identification, tells me that this is the first female of its species in any collection in the United States.

*Mpwapwa (Mpapwa, Mpapua), Dodoma District, Ugogo. Alt. 4,000 feet.*

Situated eighty-five kilometres east, slightly southeast, of Dodoma and about ten miles north of Gulwe (Igulwe) station on the Central Railway.

Camped from November 21st to 23rd, 1929.

At this place the lesser rains usually commence about November 15th but the countryside was desperately parched at the time of my arrival for only one small shower had fallen and that a week before our visit. The Veterinary Department very kindly placed their newly built and unoccupied office at my disposal for the two and a half days that I spent at Mpwapwa. This office faces a belt of fine trees, wild fig predominating, which fringe the water course that comes down from the 6,000 foot range behind. The river was, of course, dry, but a very small stream, whose source was a spring in the river bed, trickled down the course.

The domestic bananas opposite the office were devoid of frogs, and their roots, grounded in sandy soil, were dry. Along the edges of the stream we secured a very few young *Rana f. chapini* and near the head of the valley, where conditions were moister, hundreds of *Arthroleptis xenodactylus* hopped about among the dry leaves which formed a belt along either side of the stream. A great many dead tree trunks, situated more or less near the stream, were broken open and examined and the ground beneath them dug up but only one of the whole number produced any reptiles. The excavation of this one resulted in the removal of a good cartload of rubbish and uncovered a *Paragonatodes quattuorseriatus*, *Amphisbaena* sp. n., *Melanoseps ater* and *Prosymna ambigua*. Of these the lizards as well as *A. xenodactylus* are creatures associated with mountain rain forest and it is obvious that at Mpwapwa we have a remnant of virgin forest fauna in a region that is fast undergoing desiccation.

To the east of the office there is open thorn bush growing on a volcanic ash soil of rufous color; in places sand overlays the soil to a depth of six inches

and everything was so dry that the soil was like caked dust. A broad river bed occupied the open valley bottom and on one bank of this was the charred stump of an old tree which yielded results. All the other dead trunks and stumps in the vicinity were non-productive without a single exception. We spent two hours in digging out the decayed roots of this giant tree and removed a ton of soil altogether. It struck me as curious that so many species should be represented by only single specimens. The catch from this one tree was: *Rhinocalamus dimidiatus* (topotype), *Causus defilippi*, *Hemidactylus w. wernerii*, 2 *Riopa s. modestum* (topotypes), 3 *Ablepharus wahlbergii*, 2 *Bufo r. regularis*, 3 *Arthroleptis s. stenodactylus* besides many invertebrates—scorpions, centipedes and polydesmids.

Mpwapwa is also type locality for *Geocalamus modestus* and *Arthroleptis scheffleri* in addition to the topotypic species secured.

*Kilimatinde, Manyoni District, Ugogo. Alt. 3,591 feet.*

Situated fifteen kilometres south of Saranda station on the Central Railway and southeast of Manyoni which is 4,160 feet.

At Mission on November 26th and 27th.

The rains had failed except for a very few showers, in consequence everything was parched and the fields of stubble were blanketed with dust; the areas of red volcanic soil were somewhat more compact.

Five hyrax (*Heterohyrax brucei prittwiti*) were shot one evening in this, its type locality; they yielded a rich harvest of parasitic worms. Other mammals seen were *Papio neumanni*, *Cercopithecus a. johnstoni*, *Myonax grantii*, *M. s. proteus*, warthog, bushbuck, duiker and dikdik, the last of which were very common.

Reptiles were scarce except for *H. mabouia*, *A. a. dodomae* and *M. v. varia* which occur upon the rocks in the dry watercourses. A *Chameleon d. dilepis* and *Chiromantis p. petersi* (topotype of *C. pictus* Ahl) were taken upon a Manyara hedge. The only snakes seen were two *Psammophis biseriatus* and a *Naja nigricollis*.

*Saranda, Manyoni District, Ugogo. Alt. 3,511 feet.*

A station on the Central Railway between Dodoma and Tabora.

Camped from November 28th to 30th and December 18th to 19th, 1929.

No rains had fallen at the time of our first visit though daily threatening and dust storms whirled across the countryside. The types of country in the vicinity of Saranda are numerous, open thorn bush in the vicinity of the station, miles of almost impenetrable scrub to the south while maiombo bush of varying density flourished on the dry and stony escarpment to the northwest.

Though a halt was only made at Saranda to change from train to motor lorry it was hoped to secure topotypic material of *Guttera edwardi granti* and *Lygodactylus manni*, two species of doubtful status. In this we were success-

ful, with the result that *granti* which has been discredited, is considered valid and *manni* becomes a synonym of *picturatus*.

*Unyanganyi (Kinjanganja), Singida District.* Alt. circa 4,500 feet.

Situated between Singida and Kondoa Irangi due north of Saranda.

Camped from December 3rd to 9th, 1929.

The first of the lesser rains fell on the afternoon of the 5th., but was quickly absorbed by the parched ground though some pools remained in the *mbugwe*. It rained steadily for a couple of hours on the night of the 5th but remained fine thereafter.

This place was visited, since "Kinjanganja am Turu" is the type locality for the smallest and supposedly one of the rarest skinks in East Africa, *Ablepharus megalurus* Nieden. Kinjanganja is synonymous with Unyanganyi, no definite locality but an area of the former German district of Turu, partly inhabited by the Wanyaturu and Wataturu. In the Unyanganyi country there are various scattered groups of huts usually known by the name of the petty chief or jumbe. The jumbes whose names appear on German maps have since died or been superseded and some are almost forgotten already. My camp was half-a-mile south of Jumbe Abdulla's of Kifumbu. There are a group of shops beside the main road from Singida to Kondoa Irangi, about fifteen miles east of the former and I was assured that this was the approximate centre of Unyanganyi. This village is at the north end of an "island" of raised ground with a kopje occupying the centre, the raised ground is mostly red volcanic ash though so sandy in spots as to be like a desert. It is surrounded by a very extensive *mbugwe* (plain) of black (or gray) cotton soil which being very desiccated at the time of our visit is full of fissures. The plain is a mile or more broad and is backed to the north and west by a steep escarpment.

Drinking water was obtained from holes dug ten feet deep in this *mbugwe* and was like thick soup by reason of the gray mud in suspension. Each afternoon clouds collected in the east and hurricanes of wind raised "dust devils" which whirled through camp leaving one choking, and a deposit of dust, sand and straws over everything.

*Masiliwa, Turu, Singida District.* Alt. circa 4,500 feet.

Situated just south of Jumbe Ali's village, Kalingwa on the Singida to Kondoa Irangi main road a day's march east of the camp at Unyanganyi.

Camped on the night of November 9th, 1929.

Several showers had occurred in this dry thorn-bush and rock-strewn country. Porters arrived at 3 p.m. with the loads and a heavy downpour lasted from 4 till 5 p.m., then steady rain from 7 p.m. through most of the night.

Rhinoceros were said to be a great pest here, waiting about the water holes and menacing natives and cattle; they certainly had wrought havoc with the manyara hedge fifty feet from my tent. Dikdik were seen and signs

of larger game. During the night a leopard remained very close to camp, coughing three times during that period. Lions were heard in the distance.

After dinner I took a lamp and walked to and fro over a recently hoed field resulting in the capture of a large series of several burrowing amphibia *Rana delalandii*, *Hemisis marmoratum guineensis* and one *Breviceps mossambicus*. Half-a-dozen of the latter were taken the following morning in open maiombo bush a few miles away, also a Boomslang was found swallowing a *Leptopelis bocagii* and had another in its stomach; it was of interest to note that all four species taken in this arid country were of different genera yet provided with shovel-shaped metatarsal tubercles to enable them to "dig-in" during the dry season.

*Handa, Usandawi, Kondoa Irangi District.* Alt. circa 4,000 feet.

On a cross-country trail from Kalingwa to Mangasini.

Midday halt on November 10th, 1929.

An open area cleared of maiombo bush for cattle grazing. A series of deep water holes in the valley bottom are surrounded by thorny fences or *bomas* of piled-up thorn bush. To the south of these water holes, acacia thorn bush of considerable extent followed by open *mbugwes*; a promising game country but none seen.

*Maji Malulu, Usandawi, Kondoa Irangi District.* Alt. circa 4,000 ft.

On a cross-country trail from Handa to Mangasini.

Camped on the night of November 10th, 1929.

Slight showers had fallen and one storm during the night of our stay which was from about 4 p.m. to 7 a.m.

Tents were pitched beneath a baobab, one of several in a large area of cleared land in which were a dozen native *tembes*. To the south this area was surrounded by thorn bush on gray soil, to the north some maiombo forest on red soil. Water is said to be very scarce hereabouts.

Though I went out with a local native from 5 to 7 p.m. little of interest was seen and the only reptiles collected were a gecko (*H. w. werneri*) and an Egg-eating Snake (*Dasypeltis scaber*).

*Mangasini, Usandawi, Kondoa Irangi District.* Alt. circa 4,000 feet.

Mangasini is a native corruption of the word Magazine and was given to the village which was used as a store base by the German troops during the earlier part of the East African Campaign. A few miles distant is the German farm of Kwa Mtoro, type locality of Werner's *Mabuya obsti*, a synonym of *M. quinquetaeniata*. It was with the object of securing topotypic material of this skink that Mangasini was included in the itinerary but no trace was found of this skink on the kopjes about Kwa Mtoro though it undoubtedly occurs there.

Camped from December 11th to 16th, 1929.



Hardly any rain had fallen up to the time of our arrival and the whole countryside was parched and dusty. At 5 p.m. on the 12th it began to rain and after sunset there was a terrific thunderstorm and the rain came down in torrents continuing without cessation until noon of the following day. This storm awoke the amphibian and insect life and enabled us to secure series of things which under normal conditions would have been impossible.

A small undescribed species of *Bufo* was found in the *mbugwe* where thirty were collected, here also *Rana floweri* of the Sudan was found in surprising numbers. This was also the case with *Chiromantis p. petersi* for these arboreal frogs assembled and started making their froth "nests" about the accumulations of rain water.

The large black scorpions (*Pandinus cavimanus*) were common, as also the Trombid mites of a plush appearance which the natives call "the child of the rain" as they make their appearance after showers.

*Kikuyu, Dodoma District, Ugogo. Alt. 3,900 feet.*

Kikuyu is but a mile and a half south of Dodoma whose physical characteristics I have recently described (Loveridge, 1928, Proc. U. S. Nat. Mus., 73, Art. 17, pp. 3-4). This Kikuyu should not be confused with Ikikuyu to the south of Gulwe station where I collected in 1923. Specimens collected from here are just as much topotypes of species accredited to Dodoma as if they were so labelled as they were hunted in the intervening area.

Camped from December 21st to 26th, 1929.

The weather was fine for three of the four days spent here but little collecting was done, the halt before proceeding south being made to enable me to purchase Wagogo ethnological material and to pack and dispatch to the coast the results of the past six weeks collecting. We arrived late in the afternoon of the 21st and left before 9 a.m. on the 26th, motoring to Iringa which was reached at 10 p.m. the same night.

Topotypes were collected of *Elephantulus renatus*, *Pedetes dentifer* and *Agama a. dodomae* as well as an undescribed species of *Leggada* found running about the road at night.

*Dabaga, Uzungwe (Utschungwe) Mountains, Iringa District. Alt. 6,000 feet.*

Situated forty miles south of Iringa in south central Tanganyika though frequently spoken of as the southwestern highlands. Uzungwe was spelt Utschungwe by the Germans and undoubtedly Uhehe was often given as a type locality for things coming from this region where Wahehe are settled. The altimeter reading for the camp, situated half-a-mile below Houter's farm, was 6,025 feet which was in accordance with various survey calculations made in the vicinity.

Camped from evening of December 27th, 1929 to January 4th, 1930.

Sunday was the only entirely fine day during the week; once it rained almost continuously for thirty-six hours. As a general rule the mornings



were fine with rain between noon and 3 p.m. and frequently rain again at 5 or 6 p.m.

The country is composed of rounded rolling hills covered (at the time of my visit) with freshly springing grass and sometimes with shrubs. Many of the hills have clumps of trees scattered here and there with dense thickets at their base, others are studded with shrubs for the most part under six feet in height, the dominant kind being a species of *Protea*. Others again are densely clothed in stunted forest, the trees twisted and gnarled by the action of lianas and rarely exceeding thirty feet in height, the undergrowth of brambles and, on the outskirts bracken, is so dense that it is quite impenetrable for collecting purposes. Though scheduled as rain forest it can hardly be considered primary tropical rain forest and the timber is useless except for fuel.

Dabaga becomes the type locality for three new reptiles which we collected, the finest being a new tree viper, *Atheris barbouri*. The others were races of *Lycophidion capense* and *Chamaeleon werneri*. Topotypes of *Ch. goetzi* and *Ch. tempeli tempeli* were also secured.

*Kigogo, Uzungwe Mountains, Iringa District. Alt. 6,000 feet.*

Altimeter readings showed considerable variations attributable to rain and temperature fluctuations. The average was just under 6,000 feet but Survey Department reading for points 500 yards below and above the camp were 6,090 and 6,234 feet respectively.

Camp was actually situated a hundred yards behind the Forest Officer's house which is near the extreme southern end of the Uzungwe Mountains and a few miles from Mufindi. I was advised that this was the only large remnant of forest in the southern part of the range. During my stay much assistance and kindness was given to me by Mr. Fraser, the Forest Officer. Kigogo takes its name from the river which flows past the Forestry quarters, plantations and nurseries.

Camped from January 11th to 31st, 1930.

Only one or two days were entirely free from rain though much of it was in the form of mist or fine driving rain. There was more sunshine between showers than one experienced at the same altitude in the Uluguru Mountains; drying of skins was noticeably better.

While the country might still be called undulating, many of the hillsides were more precipitous than at Dabaga. Shrubs were also scarcer, the hillsides being covered with bracken and grass and the tops capped with forest. Over considerable areas the forest survives on the caps of the hills and is both higher and more open than the forest in the immediate vicinity of Dabaga. Bamboo was apparently much more extensive and quite large patches of it occurred on some of the hillsides. A striking feature of this temperate rain forest was the abundance of moss which clothed the trunks and branches of the trees and from which long wisps of moss depended.

As the result of our visit Kigogo becomes type locality for five new forms or species of *Cryptomys hottentotus*, *Francolinus squamatus*, *Apalis thoracica*

and *Chamaeleon*, paratypes of three other new things were also taken there.

Only four species of reptiles were at all abundant, these were: *Duberria l. shiranum*, *Trimerorhinus t. tritaeniatus*, *Mabuya v. varia* and *Chamaeleon tempeli*, topotypes of *Ch. w. werneri* were also taken as well as the interesting limbless lizard *Melanoseps ater*.

Amphibia were scarce except for three species, viz. *Arthroleptis minutus*, *A. parvulus* and *Hyperolius marginatus* besides which only six other species were taken, the rarest being a new race of *Bufo taitanus*.

*Madehani, Ukinga Mountains, Rungwe District. Alt. 7,200 feet.*

Camp was made among the ruins of the German Lutheran Mission a hundred yards south of the village which is situated in the mountains at the north end of Lake Nyasa.

Camped from noon on February 13th to daybreak on the 27th, 1930.

The average of hours of sunshine per day during the fortnight was certainly not more than two. The routine of meteorological conditions was fairly regular during our stay. The day would dawn with a clear sky; about 8 a.m. the sky would be obscured by fleecy white clouds. An hour or two later a white mist would come creeping up from the lake, wisps of it would blow past about 10 a.m. and gradually thicken until 11 a.m. by which time we would be enveloped in a blanket of fog, raw and especially unpleasant if accompanied by a cold wind. By noon all the trees would be dripping with precipitated moisture, one's clothes quite wet by precipitation. At 1 p.m. a crack of thunder, followed a few minutes later by a downpour of rain, at times the latter continued until 4 p.m. or alternatively in a series of heavy showers with intervals of sunshine lasting from ten to fifteen minutes. From 4 till 6 p.m. it would not rain but the sky would be hidden by clouds, the vegetation would be sodden and everything clammy to the touch. When darkness fell at 7 p.m. it would begin to rain softly though on a few evenings it held off till 9 p.m.; rain would continue on and off till 3 or 4 a.m.; sometimes, but not generally, heavy downpours occurred during the night. Naturally both collecting and preservation of specimens was difficult under these conditions, and but for Dr. James P. Chapin's valued suggestion that I should take a Primus stove to dry the skins, they would undoubtedly have suffered.

Four new races of mammals and one of birds were found at Madehani, some of which at least apparently owe their differentiation to heavy rainfall and moist conditions. The genera involved are *Aethosciurus*, *Praomys*, *Otomys*, *Claviglis* and *Illadopsis*.

The forest consisted of fine large trees set far apart so that there was a more or less dense undergrowth of shrubs and grass. The trees were often heavily laden with moss and ferns. Here and there along the forest edge, or on the sides of ravines in the forest, were large patches of bamboo. A road traversed both forest and bamboo for a couple of miles and it was along this road, or in cultivated patches of former forest land, that we secured the series of *Crotaphopeltis h. tornieri* and *Atheris barbouri*, all the other snakes came

from the open grasslands and gardens. *Lygodactylus angularis* occurred on big trees along this road and on smaller isolated trees in what was obviously cleared forest land. The new species of chameleon as well as the three other kinds were found on shrubs or trees at the forest edge.

The fern-grown and most promising looking banks of the streams within the forest were entirely unproductive of amphibian life. We failed to find *Nectophrynoides vivipara* of which these mountains are part type locality. *Arthroleptis reichei* lived in the forest and *A. schubotzi* at the base of wild bananas just outside the forest. Wild bananas were abundant two miles down the road from our camp but a close examination of them failed to reveal any frogs. The *Hyperolius marginatus* were captured along the sides of swiftly-flowing streams in the valley bottoms of the grasslands without the forest, *Rana f. angolensis* was in a similar habitat while *R. f. merumontana* was taken in the grasslands and *A. parvulus* in boggy areas of the same. These bogs were studded with sundew plants.

*Mwaya, Lake Nyasa, Rungwe District. Alt. 1,700 feet.*

Much of the material from this locality is labelled "Near Mwaya" as camp was pitched three miles west of the village and lakeshore to avoid a percentage of the mosquitoes. Mwaya is just north of Karonga, Nyasaland on the north-west shore of Lake Nyasa, actually the village is separated from the lake by about a mile of swamps.

Camped from March 1st to 11th, 1930.

Rain was fitful; at first we had several entirely fine days with heavy rain at night, this period was succeeded by one in which downpours lasting an hour or more occurred both morning and afternoon; during the last two days of our stay there was almost continuous rain. When not raining the sun shone with great force.

As one descended from Madehani in the Livingstone Mountains, the last thousand feet or so closely resembled the hills just north of Kilosa station; the same open maiombo bush, the same red soil and gravelly paths. At 2,300 feet one passed through a ravine bordered by big trees where butterflies typical of the Kilosa fauna — *Euphaedra neophron* and *Hamanumida daedalus* — settled upon the leaf-strewn path. Emerging from the ravine we marched for miles through sword grass precisely like that to be found on the Kilosa flats.

Camp was made beside the Mwaya-Tukuyu road at a village named Ndora where banana plantations were very extensive. The Mbaka River, type locality for a race of waterbuck described by Matschie, flowed close by and the rank vegetation which smothered its banks might have been that of the Myombo River near Kilosa.

To the south stretched plains of which great patches were inundated at this season and on part of which rice was being cultivated. All the animals collected at Mwaya were common to Kilosa except three forms of antelope which had their counterparts in Usagara.

In the main the birds were also those of the Kilosa region but with an admixture of southern forms.

The snakes were all common and widely distributed species with the exception of *Dromophis lineatus*, *Rhamphiophis acutus* and *Vipera superciliaris*. The taking of the two last mentioned species provided the first records for Tanganyika Territory.

There was little of interest among the frogs except the taking of *Arthroleptis whytii*, *Leptopelis johnstoni* and *Megalixalus brachynemis*, all of which had been described from near Karonga just across the border.

*Tukuyu, Rungwe District. Alt. 5,000 feet.*

In 1918 Neu Langenburg reverted to its native name of Tukuyu; it is the capital town of the Rungwe District but is about twenty miles southwest of the mountain which gives its name to the district. It is forty miles by road to Mwaya on Lake Nyasa.

At rest house from March 12 to 14th, and April 18 to 23rd, 1930.

Frequent showers and driving mist occurred during our stay.

These brief stays at Tukuyu on the way to and from Rungwe and the Porotos were made to replenish stores, arrange for transport, and to permanently pack specimens obtained at Mwaya and Rungwe. As the transport expected on the 21st failed, though hampered by uncertainty as to its arrival, we managed to get some collecting done.

The region about Tukuyu consists of rolling, hilly country with a vegetation and climate strongly reminiscent of the Kikuyu highlands in the vicinity of Nairobi. There is no forest but a great deal of planting of introduced trees has been accomplished. One ravine has been laid out as a public garden by a past administrator — Major Carveth Wells, and wild bananas and other local forest plants or trees flourish in profusion and form a centre of attraction for forest-living birds which would be absent otherwise.

*Typhlops s. mucroso* and *Boaedon lineatus* were the only snakes collected but Sternfeld lists six species, among them two very doubtful ones, viz. *Chlorophis irregularis* and *Psammophis notostictus*, one wonders if these should not be *Philothamnus s. dorsalis* and *Psammophis sibilans* both of which were common at Mwaya.

Of amphibia we collected *X. poweri*, *B. r. regularis*, *R. f. angolensis*, *R. m. mascareniensis*, *A. whytii* and saw *A. schubotzi*. Nieden lists three of these and adds *P. bifasciata*, *R. oxyrhynchus* and *Phrynobatrachus acridoides*.

*Ilolo, Rungwe District. Alt. 4,600 feet.*

Camp was made for a week-end beside the village just below the Rungwe Mission and three miles below my subsequent camp in the Nkuka Forest. There is an uplands fauna at Ilolo, as distinct from that of the forest, and during the earlier part of my stay in the forest children came up from the village with specimens which were duly labelled "Ilolo," thus for the period

from March 24th to April 17th labels may read either Ilolo or Nkuka Forest for the same date. Once or twice Salimu or I went down to Ilolo and collected birds in the vicinity either coming or returning.

March 15th, 16th, 24th to 31st and April 1st to 17th, 1930.

Rain daily and heavy. Empty four-gallon kerosene drums placed anywhere beneath the awning of my tent were full and running over on the morning of the 16th.

While the village is concealed among dense banana plantations, the surrounding country largely consists of open grassland savannah with a few scattered shrubs here and there; the general appearance being very similar to types of country in the vicinity of Nairobi. In the direction of the Poroto Mountains there is a steady rise and both streams and rivers tend to cut deep ravines which become choked with shoulder-high grass, brambles and stunted trees.

*Nyamwanga, Poroto Mountains, Rungwe District. Alt. 6,400 feet.*

Nyamwanga is an Usafwa (Usafua) village a hard day's march north of Tukuyu. It is sometimes known as Marupindi's village after the name of the chief.

Camped on the nights of March 17th and 20th on the way up and down from Ngosi Volcano.

There was heavy rain on both the afternoons that I was at this camp, it was cloudy and dull in the intervals between downpours.

Nyamwanga is situated in rolling grasslands, rising steeply to the mountains which surround it on three sides. Shrubs are common but trees are scarce in the immediate vicinity though plentiful three miles away; doubtless they have been cut for fuel and timber in the neighborhood of the village.

Not a snake or a lizard was brought in by the natives; on the other hand four species of chameleons were so abundant that I bought over a hundred in two hours among which were a good series of topotypes of *C. fülleborni* and a few of a new kind.

Frogs also were plentiful but no great variety of species so that it was necessary to limit purchases which were at the rate of a dollar per four hundred. At this price the children considered themselves well repaid, i. e. an East African cent for each frog.

From the above it will be seen that the people, who see very few Europeans, were friendly at unusually short notice and are quite keen to get money. Perhaps rather too keen, as the chief's clerk and tax collector visited my tent about midnight with a view to investigating the cash box; failing to achieve this, however, he spent six months in jail.

*Ngosi Volcano, Poroto Mountains, Rungwe District. Alt. 7,170 feet.*

The Crater Lake of this well-known volcano was Nieden's type locality for *Rana fülleborni* and *Arthroleptis reichei* and was visited with a view to

securing topotype series in which we were successful; it is a three hour's march from Nyamwanga.

Camped on the narrow lip of the crater from March 18-20th, 1930.

We arrived at noon on the 18th in driving rain which continued without intermission until 9 a.m. the following day. It rained on and off during our stay with a minimum of sunshine. The sodden condition of the forest during the rainy season probably causes many of the birds and mammals to leave it for that period.

Colobus, Blue Monkey and leopard were the only animals of which we had evidence, the former we actually saw.

Birds were so scarce that I only observed four species during the three days we spent on the volcano, viz. *Corvultur albicollis*, *Pseudoalcippe stierlingi*, *Batis mixta* and a coot which was swimming on the crater lake. No birds were shot as generally they would have fallen from fifty to a hundred feet and been hopelessly lost among the vegetation.

The only reptiles seen were the diminutive chameleon, *Brookesia platyceps*, which appeared to be tolerably common.

In addition to the topotypes mentioned above we took a single specimen of *Arthroleptis adolfi-friederici*. The commonest amphibia were *Nectophrynoides viripara* and *Hyperolius marginatus* Peters; since my return, what I should call *marginatus*, has been twice redescribed under the names of *H. pictus* and *H. ngoriensis*, Dr. Ahl giving "Ngori" Crater Lake as type locality for both, the former is based on adults and the latter on the young! We failed to find caecilians, though the situation seemed to be ideal and they should be present.

It was 3 p.m. on the day of our arrival before we got the lip of the crater sufficiently levelled off to be able to pitch, or rather sling, two tents between cables affixed to trees growing up from the precipitous sides of the crater. No collecting was attempted the first day, but we set out when the rain stopped at 9 the following morning and secured forty frogs in four and three-quarter hours, being subjected to frequent heavy showers. The next day we left camp at 8.30 a.m. and returned at 3.30 p.m., drenched to the skin after an hour's scramble up from the crater lake in pouring rain. During the dry season it is possible that meteorological conditions are very different and more propitious for collecting.

*Nkuka Forest, Rungwe Mountains, Rungwe District. Alt. 5,460 feet.*

Though all labels from this camp read "Rungwe Mtn." the actual site of the camp was on that occupied by Mr. R. E. Boulton of the American Museum Expedition and was in the Nkuka Forest just above the Nkuka River close beside the trail used by the lumbermen employed by the Rungwe Mission. Dr. Fülleborn stayed at the Mission which was scarcely three miles from the camp, Ahl cites Rungwe or Rugwe (sic) for the material which he collected.

Camped from March 24th to April 17th, 1930.

We scarcely saw the sun during the whole of the first fortnight of our stay. Rain fell in torrents at any hour of the day and during most of the night. One night the rain gauge at the mission station (below and outside the forest) having been emptied at sunset was found overflowing the next morning, i. e. a fall of *over* 125 mm. (5 inches) in one night. On April 2nd-3rd it rained for 26 hours without stopping. Naturally such conditions militated against the best collecting, setting rat-traps was useless and by day birds were so scarce that I have walked for two hours without getting a single specimen.

With the new moon, about April 6th, a change took place and though, with one exception, rain fell daily thereafter, it came chiefly between noon and 4 p.m. leaving the mornings clear and sunny. With the changed conditions native children began bringing up frogs from the region of cultivation half-an-hour's walk down the mountain (these were labelled Ilolo) but they showed little ability or energy in attempting to secure any but the most common and obvious creatures.

The forest itself is magnificent, the trees in large areas attain a great height and support masses of ferns, moss and lianas of various species. In ravines the tree ferns predominate and reach a height of twelve feet. Wild bananas are more abundant than in any other East African forest with which I am familiar. Where the trees are very tall the undergrowth is of the thicket type and often impenetrable in places; in areas where the trees are smaller, the forest floor is largely covered with grass and plants including many stinging nettles. About 2,000 feet above the camp, one enters the bamboo belt where these plants predominate.

Mammals are by no means common with the exception of colobus, blue monkey and blue duiker; leopards, squirrels and moles are not rare but elephant shrews were decidedly so in this part of the forest. Though no bats were collected at least six species were seen but they flew about the tops of the trees and seldom came so low as to be within striking distance of a net. Twenty years ago elephant and buffalo were to be found in this forest but have long since disappeared. One pit for elephant is still to be seen near the summit of the mountain and I have talked with a native who remembers having seen elephant on Rungwe.

As compared with the Uluguru Mountains, birds were scarce except for a few dominant species of bulbul, flycatcher and crested hornbills, the strident cries of the latter might be heard at most hours of the day. Four undescribed races were collected and for two of these — forms of *Illadopsis stictigula* and *Linnurgus kilimensis* — the Nkuka Forest becomes type locality.

Reptiles were scarce; with the exception of *Crotaphopeltis h. tornieri*, the only other snakes found in the forest were *Natrix olivaceus* and *Chlorophis hoplogaster*. Not a lizard was found in the forest but *Lygodactylus angularis* and three species of chameleons, one of which was new, occurred at the forest edge and some of the chameleons undoubtedly might be found in glades where there was sufficient sunlight.

*Bufo r. regularis* actually occurred in clearings near the lower edge of the



forest. *Nectophrynoides vivipara*, for which Rungwe is part type locality, having been collected there by Fülleborn, is almost restricted to the bamboo belt at a high altitude; at first I was inclined to think that it was the commonest amphibian in the forest but with the change in climate we discovered that the lower forest swarmed with *Arthroleptis schubotzi* and to a less extent with *A. reichei*. *A. whytii* lives at the forest edge as does *Rana f. angolensis* though several of the latter were taken in deep forest. *Leptopelis vermiculatus* of the Usambara Mountains was taken. An undescribed race of *Probreviceps macrodactylus* of the Usambara Mountains completes the list of amphibia. With all their abundance not a single wild banana plant was found harboring a frog; this was certainly remarkable.

*Igale, Poroto Mountains, Rungwe District. Alt. 6,000 feet.*

Camp was made beside the road a little over a mile on the Mbeya side of Igale Pass, Tukuyu to Abercorn road.

Camped from April 24th to May 1st, 1930.

We arrived at 6.30 p.m. in driving rain and pitched tents by lantern light in a high wind; the rain continued until 10 a.m. the following day. The 25th was fine, practically rainless but on the 26th it rained from dawn till sunset, the fine rain driving before a blustering gale that made one think of the seashore. Unfortunately, having arrived in the dark, we had chosen a somewhat exposed position.

The country is rather difficult to describe, consisting as it does of steep hillsides, the tops are crowned with more or less short grass which increases in height as one descends until in the valleys the rank growth of grass and sedges is well above one's head. In the ravines the vegetation was not dissimilar to that growing in the vicinity of Morogoro and included a large number of acacia trees. Near the camp was a patch of rain forest not a hundred cubic yards in extent but a rendezvous for many birds. It was on the outskirts of this patch that most of the ornithological collecting was done. A few miles back towards Tukuyu there was abundance of forest but somewhat dry and not very interesting, it was here that squirrels were encountered. Streams occur along the bottoms of the principal valley and otters visited them for the sake of the freshwater crabs.

We concentrated on bird collecting as Unyika or the Nyika Plateau is type locality for many southern forms. New races of *Bessornis albigularis* and *Zosterops virens* resulted from this work, both coming from the nearby forest alluded to above.

Two reptiles were exceedingly abundant, the Striped Schaapsteker (*Trimororhinus t. tritaeniatatus*) and the Variable Skink (*Mabuya v. varia*); apart from these two forms, reptiles were decidedly scarce. I was greatly puzzled by the scarcity of chameleons in this part of the Porotos when they were so numerous at Nyamwanga and in the vicinity of Ngosi Volcano. The shrubs and other vegetation adjacent to the forest were not dissimilar. One can only postulate that the climate is too wet and cold for the development of their eggs which



would not affect ovoviviparous species like the Variable Skink; yet this seems scarcely likely to be the only explanation.

*Nyamkolo, Lake Tanganyika, Northern Rhodesia. Alt. 2,700 feet.*

Nyamkolo has been variously spelt as Niomkolo, Kinyamkolo, and Kinyamkole. The prefix "Ki" is an augmentative in the local dialect in direct contrast to its use as a diminutive in Swahili. I learned this from Mr. White, a veteran missionary of the London Missionary Society, who told me that Moore had stayed at Nyamkolo the year previous to his own arrival.

Camped from May 7th to 11th, 1931.

The rains had ended in March and the country round about was already dry and dusty.

My tent was pitched on the edge of a rocky bluff a hundred feet above, and two hundred yards from the lakeshore. In the immediate vicinity was arid scrub composed of stunted trees; the very large village was a hundred yards behind. Below the bluff were semi-swamped grasslands and some acres of grass and sedge standing in water. Over the swamped grass dragonflies of many species darted and hovered; nearly a hundred were netted in an hour. Further out in the acacias and sedges weaver birds clung to their nests for some were still building though other nests held young. A great bank comprised entirely of shells extended as a breakwater for half a mile or more around the bay in whose waters crocodiles might be seen swimming lazily in the early morning.

We had come to *Nyamkolo* because it was the type locality of a frog *Arthroleptis moorii* only known from a holotype collected by Moore in 1901; we only found it on the second day among the still verdant grass of a cattle pasture near the lakeshore. The taking of *Hyperolius rhodoscelis*, *H. granulatus*, and *Phrynobatrachus perpalmaris* all of which were described from Lake Mweru, due west of Nyamkolo, was of considerable interest. The toads also, which I am calling *Bufo r. regularis* seem to be intermediate with *B. lemairii* though I regard the latter as distinct. The only other species taken were *H. callichromus*, *R. occipitalis* and *R. m. mascareniensis*.

*Kasanga, Lake Tanganyika, Namanyere District, Urungu. Alt. 2,700 feet.*

Kasanga is the original native name of Bismarckburg and lies on a flat river delta at the southeastern end of the lake a little north of the border between Tanganyika and Northern Rhodesia.

A few hours on May 13th, camped from May 16th to 17th, 1930.

Dry season.

Three hours were spent collecting porters for the journey to Kitungulu when we arrived on the morning of May 13th. On our return we reached Kasanga after midday on the 16th. The same afternoon I set out for the rocks in search of the aquatic cobra and both morning and afternoon of the 17th in a boat after the same quarry.

The promontories bounding Kasanga Bay to the north and south are composed chiefly of masses of rock, while a very short distance behind the town rises a semicircle of stone-strewn hills which are densely clothed with scrub and close-set dry forest. The town itself is very well provided with palms and mango trees and its vegetation is generally similar to what one finds at any sea-level coastal town such as Dar es Salaam.

The bay was delightful, many gorgeously coloured little fish could be seen swimming in the clear waters adjacent to the rocky headlands. It is doubtless due to the abundance of fish that the water cobra — *Boulengerina a. stormsi* — is so common.

Salimu attempted to secure *Procavia munzneri* which we had seen on the rocky shore south of the town as we rowed up the coast; the species was described from Kasanga. Though he failed to get it he procured an interesting squirrel — *Paraxerus cepapi quotus*.

*Kitungulu, Namanyere District, Urungu. Alt. circa 4,000 feet.*

Kitungulu is in the hills east of Kasanga. Despite the "Ki" the village is composed of less than a dozen huts. Ntungulu lies still further east of Ki(n)-tungulu. It is on the old German road from Kasanga to Tukuyu which has fallen into disuse and likely to remain so as being unsuitable for motor traffic. Though only twelve miles from Kasanga it is a good five hours march over a stony track that appears to be something of a nightmare to the local porters and I was informed that all able-bodied men were leaving Kasanga because they disliked portage.

Camped from May 14th to 15th, 1930 without tentage.

Dry season.

Kitungulu is the type locality for *Typhlops gracilis* collected here about 1909-1910 by Capt. Fromm and Herr Hauptmann who made a prolonged stay in the neighbourhood while collecting birds. I visited their old camp site and every conceivable place where the blind snake might be found but though, without any help from the local natives, we secured eleven snakes of eight species we failed to get this interesting reptile.

At Kitungulu there is a patch of rain forest bordering the river, little is left of it for it is no longer being preserved as in German times and the natives are felling and burning it. We searched among the rotting trunks of felled and half burnt trees whose dead leaves still strewed the ground and among which great numbers of *Arthroleptis xenodactylus* were found, the larger *A. s. stenodactylus* was in the dry forest.

Adjacent to this relic of virgin forest was very dry orchard forest similar in type to that at Saranda on the Central Railway, the soil was also of the same red and stony nature so that two entirely different faunas were existing in close proximity.

Lemurs were heard at night and a blue duiker was seen one day; a shrew that was taken in a midden proved to be a new race of *Suncus varilla*.

A flock of gray parrots was seen at close quarters and only took to flight

as Salimu was stalking them. *Coracias s. spatulatus* and *Lybius l. macclounii* were perhaps the most interesting of the birds collected.

An undescribed *Bufo* was found in dry forest in the vicinity of the primary forest, where it was more abundant.

*Kipili, Lake Tanganyika, Namanyere District, Urungu.* Alt. 2,700 feet.

A port of call of the lake steamers on the east shore of the lake.

May 19th, 1930.

Dry season.

A jetty is built out from the low-lying sandy bay. At the time of our visit the hills, which rise from the bay, were clothed in rank dry grass among which were stunted trees.

Some guineafowl (*Numida m. rikwae*) and reptiles, including a new race of agama lizard, were collected. Frogs were found in stagnant pools of water in the native gardens where castor oil plants and mango trees were much in evidence. Opposite to Kipili across the bay is a rocky shore where otters and water cobras are to be found.

*Sumbwa, Lake Tanganyika, Ufipa.* Alt. 2,700 feet.

A port of call of the lake steamers on the east shore of the lake.

May 20th, 1930.

Dry season.

Three or four hours were spent ashore at this port; there are only two native huts by the jetty which had been pounded to bits by the strong waves. The reason for the steamer calling at this desolate spot is to collect produce brought down from a densely populated area some seven miles away.

To the north a beautiful, though narrow, strip of sandy beach stretches for many miles. Shells were abundant along this beach and sand-colored tiger beetles rose in clouds or ran ahead of one along the shore. On the far side of the beach, fifty feet from the water's edge, are deep and impassable swamps reaching to the sluggish river which, concealed by dense beds of sedge, acacia bushes and other vegetation, empties itself to the right of the jetty.

A freshly deceased example of a scarce snake (*Glypholycus bicolor*) was found upon the beach; it is of aquatic habits and is known only from Lake Tanganyika. The finding of a little frog (*Phrynobatrachus perpalmatus*) in the swamp constituted the first record of its occurrence in Tanganyika Territory.

*Ujiji, Lake Tanganyika, Kigoma District.* Alt. 2,800 feet.

Ujiji (Udjiji), the famous old Arab settlement on the east coast of the lake, is five miles south of Kigoma, the terminus of the Central Railway which connects the lake with Dar es Salaam on the coast.

Camped from May 22nd to 29th, 1930.

Dry season.

Ujiji looks very attractive in the distance for it is well supplied with mango trees which offer a grateful shade after the open and treeless country round about. Unfortunately, however, the many marshes in the vicinity and lying between Ujiji and the lake, breed hordes of mosquitoes and gnats which render life unpleasant by biting day and night. At this season of the year Ujiji is not a good collecting centre though probably excellent at the breaking of the rains. Visits were made down the coast to the Luiche (Luitsche) River and north to the Bangwe headland, where quantities of the freshwater medusa (*Limnocořida tanganyicae*) were seen.

Search was made for the Slender-snouted Crocodile (*Crocodylus cataphractus*) which has been reported from Ujiji but more probably came from the Luiche River. The species appears to be well-known to the fishermen but on reaching the river, up which we paddled for a great distance, we found it still in flood, overflowing its banks and inundating acres of surrounding country, as a result of the unprecedented rains of 1930. A skull of this crocodile was seen in the Provincial Commissioner's house. Nile Crocodiles were plentiful though very wary.

Ujiji is type locality for *Amphisbaena phylofiniens* Tornier; we were unsuccessful in locating any but secured a pair of another interesting rain-forest form, *Typhlops graueri*, heretofore only known from the type which came from the forested region northwest of the lake. *Lygodactylus picturatus gutturalis* is a western race which was unknown from east of the lakes but is abundant at Ujiji; in all probability having been introduced in loads of produce when there was so much traffic with the Congo in the days of the slavers.

*Shinyanga, Shinyanga District, Usukuma. Alt. 3,669 feet.*

Shinyanga is 123 miles north of Tabora on the Tabora to Mwanza branch line of the Central Railway.

I was the guest of the late Mr. J. B. Charlesworth from June 2nd to 4th, 1930.

The annual rainfall is about thirty inches and occurs between October and April, November being the wettest month. At the time of my arrival, Shinyanga had already experienced two months of drought and the countryside was bone-dry with the exception of a few shrinking pools here and there.

Bird life is rich and varied, particularly among the scattered baobabs a few miles out on the Ibadikuli road where a great variety of eagles and hawks were seen. The whistling cries of the small love birds (*Agapornis fischeri*) are quite prominent among the sounds of the bush.

The stop-over in Shinyanga was made with the object of meeting Mr. J. B. Charlesworth. No snakes were seen, and the only abundant reptiles were *Pachydactylus boulengeri* and *Agama agama mwanzae* which occur on the rocks a few miles southeast of the station. Amphibia were naturally not much in evidence at such a season and few were collected beside the pre-

sumably aestivating *Chiromantis p. petersi* found in a crow's nest on the top of a baobab.

*Mwanza, Mwanza District, Usukuma.* Alt. 3,800 feet.

Mwanza on the south or southeast shore of Lake Victoria.

Camped from June 5th to 9th and July 21st to 22nd, 1930.

It was said to be a couple of months since rain had fallen but at least one heavy shower fell each day, or at night, during the two week-ends of our stay.

Little collecting was done as my time was taken up with packing and consigning collections to the coast and making arrangements for further *safari*. I only made one excursion — of some three hours duration — during which time with thirty-three shots I secured thirty specimens, mostly mammals, *Coleura afra* and topotypes of *Procavia matschie* and *Heterohyrax brucei victorianjansae*. Topotypes of *Tatera vicina muansae*, *Mastomys microdon victoriae* and *Arvicanthus abyssinicus muansae* were also preserved.

Perhaps the most astonishing thing is the boldness of the hyrax; elsewhere one is accustomed to seeing these timid creatures disappear into their rocky fortresses while one is still far away. Near Mwanza they may be seen in great abundance placidly sitting within easy gunshot or occasionally one will actually climb from its cranny to the top of a boulder in order to get a better view of the visitor.

Mwanza is rich in bird life, the calling of Sea Eagles over the township is a matter of daily occurrence, cormorants ornament every little jutting rock while Hadadah Ibis and Egyptian Geese plod about in the marshes quite close to the main road.

*Ukerewe Island, southeastern Victoria Nyanza.* Alt. 3,800 feet.

Camp was made at Murutunguru where there is a long-established Roman Catholic Mission known as Marienhof.

Camped from June 10th to 20th, 1930.

Dry season. No rain had fallen for some time prior to our arrival and none during our stay. The heat, very pronounced in sheltered spots, was tempered elsewhere by breezes from the lake; towards midday these became so violent as to raise clouds of dust which was in due course deposited over all one's possessions.

The level of the lake varies from year to year and in authoritative works is variously stated to be 3,720, 3,780 and 3,800 feet; the island rises from a hundred to two hundred feet above the lake. Dr. Bailey Willis has suggested that about fifty miles of solid crystalline rocks lie below the lake and that great heat has forced up the less solid margins so that the lake is comparable to a shallow saucer. The island is only separated from the mainland by a narrow channel, so that a lion was able to swim it early in 1930, and was still resident on the island at the time of my visit.

From Mwanza one crosses the entrance to Speke Gulf by a steam tug and lands at Nansyo, the port on Ukerewe. The journey takes from five to six hours. From Nansyo it is ten miles to Murutunguru; I was driven over by an Indian owning the only lorry on the island, a fact of which he was fully cognisant and kept reminding me. I returned to Nansyo on foot while the loads were brought on three ox-carts hired from the mission; porters are almost unobtainable as the people do not like such work and are sufficiently affluent as to be independent.

The reason for selecting Murutunguru was partly for its central location, but chiefly because Père A. Conrads is still resident there. Père Conrads is an entomologist with a general interest in zoölogy, and I had come to the island in search of topotypic material of several forms discovered by him. We were successful in getting *Hystrix galeata conradsii* and *Coliuspasser macrourus conradsii* but failed in finding *Calogale conradsii*, *Rhinoptilus cinctus emini* and *Atractaspis conradsii*.

The abundance of carnivora on the island is one of its interesting features, doubtless this accounts for the shyness of the game birds. There is an abundance of bird life upon the island. Reptiles were also plentiful but, for the most part, of common and widely distributed species. Amphibia were scarce at the time of our visit.

We owed much to the kindly interest of Père Conrads who did everything possible to ensure the success of our work and showed me much hospitality. The Wakerewe, doubtless due to the long training of Père Conrads, were most helpful in bringing in specimens, though as only a small proportion speak Swahili, we had some difficulty in making known what we did *not* want.

*Bukoba, southwestern shore of Victoria Nyanza. Alt. 3,800 feet.*

Three hours (9 to 12 a.m.) were spent ashore while the S. S. *Usoga* was in harbor.

The morning was very overcast and threatening and remained so for the first two hours until the sun came out.

The town is rather pleasantly situated in a semicircle of rock-strewn hills with a sandy shore in the centre of the bay, reed-grown swamps and rocky promontories beyond. The rank growth of grass and weeds rendered collecting in the waste lands difficult so presently we wandered to the native-owned coffee plantations and here encountered a wealth of small bird life. Sixteen birds were shot including a topotype of *Pogoniulus leucolaema nyansae*.

*Entebbe, north shore of Victoria Nyanza, Uganda. Alt. 3,800 feet.*

Camped from June 26th to 29th, 1930.

According to native reports, no rain had fallen for two months until the day before our landing, when it had rained in torrents. Thunder showers occurred about noon on the 27th and 28th and a tropical downpour, lasting several hours, on Sunday 29th, but too late to affect collecting as we left shortly after sun-up on the 30th.

The Botanical Gardens remind one of Amani and everywhere are acres of well-swept lawns. The grass along the lake shore is kept cut and all the drain furrows have close-cropped banks of green instead of being shaded by the rank growth of grass beloved by frogs; furthermore these furrows are flushed with a strong disinfectant, and as if to render Entebbe still more distasteful to amphibians, the marshes and swamps are generously oiled as a measure of mosquito larvae destruction.

*Mabira Forest, near Jinja, Uganda.* Alt. circa 4,000 feet.

Spent the day collecting on July 1st, 1930.

Though it was the dry season when we visited Mabira Forest, the weather had been erratic and several showers had fallen during the past few weeks, still the forest was very dry.

The forest is of vast extent covering some 150 square miles and it should be borne in mind that my impression is based only on a couple of square miles in the vicinity of the rubber and coffee plantation which was started by the late Dr. Cuthbert Christy, the discoverer of *Leptopelis christyi* and *Hylambates verrucosus*, both of which were described from the Mabira Forest, Chagwe. It was on the off-chance of procuring one or both of these desiderata that the forest was visited.

The trees are very tall and fine, but progress among them is impossible over large areas on account of the dense undergrowth intermingled with sword grass. I was driven some three miles through the forest to a more open section where one could get about with tolerable ease. Here the forest floor was leaf-strewn, rotten logs and stumps with both moist and dry interiors were plentiful and everything seemed ideal for reptile life, but in two hours four Europeans and a native found nothing but some tree mice (*Hylomyscus stella kaimosae*) and saw a squirrel.

#### THE PROBLEM OF EAST AFRICA'S MOUNTAIN FOREST FAUNA

To return to the primary object of the trip, viz. the composition of the vertebrate fauna of these mountains in relation to that of the Uluguru range. As is well known, the plains and savannah fauna of East Africa up to about 5,000 feet is comprised for the most part of forms common to South Africa or widely distributed outside of the forest areas throughout the continent south of the Sahara desert barrier.

So long ago as 1896 it was pointed out by the late Professor J. W. Gregory that the botanical and zoölogical life of the higher mountains in this region showed closer affinities with their respective groups in West Africa than with the plains fauna and flora in their own immediate vicinity. Today these widely scattered mountains are like



so many islands, their higher slopes clothed in rain forest, which supports a fauna that is presumably unable to exist under the climatic and topographical conditions found in the intervening areas. In the case of birds it is easy to postulate flight as the method of distribution and the seeds of plants may have been disseminated in some instances through avian agency but it is a problem of no small biological interest to visualize earlier conditions through a study of the distribution of the amphibians, reptiles and mammals.

As an interesting example one might cite the arboreal lizard, *Lacerta jacksoni*, which occurs on the Kivu Volcanoes, Mt. Ruwenzori, Mt. Elgon, Mt. Gargues, Mt. Kenya, Mt. Kilimanjaro and the Usambara range but is absent from the intervening areas except at high altitudes where rain forest occurs. The sluggish, heavy bodied Gaboon Viper, *Bitis gabonica*, for long known only from the West Coast has been found in Uganda forests and in comparatively recent times was discovered in the forested regions of the Usambara Mountains within sixty miles of the Indian Ocean.

Gregory has shown that as the glaciers recede up Mt. Kenya the rain forest follows; naturally the process is a very slow one and the area of forest does not increase by reason of the constant assault by natives on the forest fringe at lower levels where they fell and burn its component trees, coveting the rich soil for raising crops. This encroaching on the forest has been proceeding for centuries and early explorers such as Mackay and Johnston speak of the remains of great forest trees on lower ground now covered by scrub or bush. It is noteworthy that the exploited and abandoned garden areas never revert to forest but produce a secondary growth of scrub and thorn which is far harder to clear than the original forest as it contains many fire-resistant types and its denser thickets are impervious to annual burning.

After a few seasons the soil of the cleared areas, exposed to the rays of a tropical sun, becomes friable and the rich soil is washed away by the heavy rainstorms; gravel and stones are left behind. The rushing floods, no longer conserved by roots and leaf mould, tear down the hillsides cutting gulleys as they go; the damage done has to be seen to be appreciated. In the Ubena Highlands it was no uncommon experience to find roads abruptly terminating in a twenty-foot drop as a result of the rush of water down them. In course of time a lessened rainfall appears to go hand in hand with the destruction of virgin forest and is considered by many to account for the indisputable desiccation of large areas in Tropical Africa. The relic



faunae of Mpwapwa and Ujiji, struggling for survival today, undoubtedly points to the fact that these regions were covered with forest in the past. At the present time, large mobs of cattle, unduly multiplied under European protection, raise clouds of dust as they wander through the thorn-bush areas of Mpwapwa in search of pasturage.

In Nyasaland, which has been longer under observation than Tanganyika, it has been computed that the impoverished land will only support half the population that it did a hundred years ago. Dr. Robert Laws, resident for half a century in the country, recently stated in evidence before the Nyasaland Lands Commission, that so recently as fifty years ago, northern sections of the country were well wooded and supplied with perennial streams. He mentioned twenty large streams which had ceased to flow in the Mombera country today but which formerly flowed all the year round prior to the wholesale destruction of the forests which had rendered the region uninhabitable. I mention this to invite attention to the imperative need for conservation of the forests. The fauna, with the exception of a few adaptable species, perishes with the forest. Officers of the Forestry Service in Tanganyika are keenly alive to the desirability of preserving the remaining forest areas but under the last administration District Officers were loth to prosecute natives for destroying forest reserves; even though the offenders were caught *flagrante delicto* by the forest guards.

From a cursory review of the distribution of the species in these mountains, it seemed likely that the oldest group of terrestrial vertebrates, *viz.* the Amphibia, slow of movement and restricted in migration, would throw most light on the problem; next the reptiles, then the mammals and lastly the birds which, by reason of their ability to fly, are less likely to furnish useful data.

Before proceeding further to discuss the conclusions, it would be well to present the data on which they are based. In compiling the following lists, *drastic elimination of all species which are not almost entirely dependent on the rain forest has been necessary*, for the inclusion of mountain-valley and high-plateau forms not only would swell the lists to two or three times their present size, but would give rise to complications, as so many of these types extend their range to the savannah.

*Amphibian Fauna Associated with  
Mountain Rain Forest*

	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga & Ubena Mtns.	Rungwe Mtn.	Poroto Mtns.
<i>Boulengerula boulengeri</i> .....	L					
<i>Boulengerula uluguruensis</i> .....		L				
<i>Scolecormorphus vittatus</i> .....	L	L				
<i>Scolecormorphus uluguruensis</i> .....		L				
<i>Scolecormorphus attenuatus</i> .....		L				
<i>Scolecormorphus kirki</i> .....				L		
<i>Bufo brauni</i> .....	L	L				
<i>Bufo micranotis</i> .....		L				
<i>Bufo taitanus uzunguensis</i> .....			L	L		L
<i>Nectophrynoides tornieri</i> .....	L	L				
<i>Nectophrynoides vivipara</i> .....		L	L	T	L	L
<i>Phrynobatrachus krefftii</i> .....	L					
<i>Arthroleptis stenodactylus uluguruensis</i> ..	L	L				
<i>Arthroleptis adolfi-friederici</i> .....	L	L				L
<i>Arthroleptis reichei</i> .....			L	L	L	L
<i>Arthroleptis schubotzi</i> .....			L	L	L	
<i>Arthroleptis xenodactylus</i> .....	L	L				
<i>Arthroleptides martiensseni</i> .....	L	L				
* <i>Leptopelis rufus</i> .....	T	L				
* <i>Leptopelis aubryi</i> .....	L					
<i>Leptopelis vermiculatus</i> .....	L		N		L	
<i>Leptopelis uluguruensis</i> (inc. <i>tanganus</i> )...	A	L				
<i>Leptopelis parkeri</i> .....		L				
<i>Callulina krefftii</i> .....	L	L				
<i>Probreviceps macrodactylus macrodactylus</i>	L					
<i>Probreviceps macrodactylus loveridgei</i> ...		L				
<i>Probreviceps macrodactylus rungwenensis</i> ...					L	
<i>Probreviceps uluguruensis</i> .....		L				
<i>Spelaeophryne methneri</i> .....		L				
<i>Parhoplophryne usambaricus</i> .....	L					
<i>Hoplophryne rogersi</i> .....	L					
<i>Hoplophryne uluguruensis</i> .....		L				
TOTAL.....	17	20	5	5	5	4

\* Common to the Cameroon Mountains.

A = Recorded by Ahl.

L = Collected by Loveridge.

N = Recorded by Nieden.

T = Recorded by Tornier.

A consideration of the foregoing shows that the affinities of the Uluguru fauna are intimately associated with those of the Usambara range to the north but have comparatively little in common with those of the southwestern highlands, only four species (or 13% for one of these has broken up into races) being found in both. Two species of the genus *Leptopelis* occurring in the Usambara, range across the Central African rain forests to the Cameroon Mountains on the west coast. One might be inclined to question the specific identity of these eastern and western frogs were it not that their distribution is paralleled by several reptiles such as *Bitis gabonica*, *Lygodactylus fischeri* and *Holaspis guentheri*, therefore there seems no valid reason for proposing fresh names for East African *Leptopelis rufus* and *aubryi* as has recently been done.

The caecilian genera *Boulengerula* and *Scolecophorus* (with which *Bdellophis* has been united) presumably originated in extreme East Africa as neither genus has Central or West African representatives so far as is known. The only caecilian genus common to both East and West is *Dermophis*, represented in Kenya Colony by *gregorii* of Ngatana and in the west by *thomensis* of St. Thomas Island in the Gulf of Guinea. So strange is this interrupted dispersal that one wonders if the genus is a natural one.

No toads associated with the East African rain forest are common to the West Coast though they have their counterparts both in species and genera, for the viviparous tree toads (*Nectophrynoides*) of the east are represented by the oviparous tree toads (*Nectophryne*) of the west.

*Phrynobatrachus* is a widely distributed genus with numerous savannah-dwelling forms, but *P. krefftii* of the Usambara Mountains and its relatives from the Central African Lake Region — *P. graueri*, *P. petropedetoides*, *P. versicolor* seem to be associated with pools in, or at the edge of, virgin forest. While the fauna of the Kivu Volcano region and adjacent primary forests are principally western in type they do possess an admixture of eastern forms as illustrated by the genus *Arthroleptis* for *A. adolfi-friederici* and *reichei* occur there but so far as is known do not extend their ranges further to the west.

The amphibia of Rungwe have more in common with the fauna of the Kivu Volcanoes than with the Usambara Mountains and one may justifiably postulate connection by virgin or gallery forest down the eastern shores of Lake Tanganyika where traces of a vanishing forest fauna still persist at Ujiji (*Typhlops graueri*) and Kitungulu (*Typhlops gracilis*, *Arthroleptis xenodactylus*, etc.).

The five Brevicipitid genera — Callulina, Probreviceps, Spelaeophryne, Parhoplophryne and Hoplophryne — are, with the exception of one race on Rungwe, known only from the Usambara and Uluguru Mountains as far as the area under discussion is concerned. Spelaeophryne was described from Kilwa and possibly may not be a true rain-forest species. While Probreviceps may be derived from Breviceps of South Africa, the ancestry of Parhoplophryne and Hoplophryne is obscure, a separate subfamily (Hoplophryninae) has been created for their reception by Noble.

*Reptilian Fauna Associated with  
Mountain Rain Forest*

	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga & Ubena Mtns.	Rungwe Mtn.	Poroto Mtns.
Typhlops kleebergi . . . . .	W					
Typhlops uluguruensis . . . . .		L				
Typhlops punctatus gierrai . . . . .	L	L				
Natrix olivaceus (mountain type) . . . . .	L	L			L	
Lycophidion meleagris . . . . .	L	L				
Prosymna ornatissima . . . . .		L				
Geodipsas vauerocegae . . . . .	L	L				
Geodipsas procterae . . . . .		L				
Crotaphopeltis hotamboeia tornieri . . . . .	L	L	L	L	L	
Crotaphopeltis werneri . . . . .	W					
*Miodon gabonensis . . . . .					L	
Aparallactus werneri . . . . .	L	L				
Aparallactus uluguruensis . . . . .	L	L				
*Elapsoidea guentheri (nigra type) . . . . .	L	L				
Causus defilippii . . . . .	L	L			N	
*Bitis gabonica . . . . .	L					
*Atheris ceratophorus . . . . .	L					
Atheris barbouri . . . . .			L	L		
Paragonatodes africanus . . . . .	L	L				
*Lygodactylus fischeri . . . . .	L	L				
Lygodactylus angularis . . . . .				L	L	
Lacerta jacksoni . . . . .	L					
*Holaspis guentheri . . . . .	L	?				

\* Common to West Africa.

L = Collected by Loveridge.

N = Recorded by Nieden.

W = Recorded by Werner.

	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga & Ubena Mtns.	Rungwe Mtn.	Poroto Mtns.
<i>Mabuya comorensis</i> .....	L	L				
<i>Siaphos kilimensis</i> .....	L	L				
<i>Scelotes eggeli</i> .....	L					
<i>Scelotes uluguruensis</i> .....		L				
<i>Scelotes tetradactyla</i> .....		L				
<i>Melanoseps ater</i> .....	L	L	L			
<i>Chamaeleon goetzei</i> .....			L	L	L	L
<i>Chamaeleon tempeli</i> .....			L	L		
<i>Chamaeleon fischeri matschiei</i> .....	L	L				
<i>Chamaeleon fischeri multituberculatus</i> ...	L					
<i>Chamaeleon deremensis</i> .....	L	L				
<i>Chamaeleon fülleborni</i> .....						L
<i>Chamaeleon werneri werneri</i> .....			L			
<i>Chamaeleon werneri dabagae</i> .....			L			
<i>Chamaeleon incornutus</i> .....				L	L	L
<i>Chamaeleon laterispinis</i> .....			L			
<i>Chamaeleon melleri</i> .....	L	L				
<i>Chamaeleon tenuis</i> .....	L					
<i>Chamaeleon spinosus</i> .....	L					
<i>Brookesia temporalis</i> .....	L					
<i>Brookesia breviceaudatus</i> .....	L	L				
<i>Brookesia platyceps</i> .....				L	L	L
TOTAL.....	29	24	8	7	8	4

L = Collected by Loveridge.

The reptiles give further conclusive evidence as to the distinctness of the Usambara-Uluguru fauna from that of the southwestern highlands. The paucity of both amphibian and reptilian life in the temperate rain forest of the southwestern highlands as compared with that of the tropical rain forest is very striking. It should be borne in mind, however, that one and a half months were spent in both the Usambara and Uluguru ranges as against a month each in the Uzungwe, Ukinga and Rungwe Mountains and only a fortnight in the Porotos.

Actually only two species of snakes are common to both the Uluguru and southwestern highlands and each of these has a closely related

and widespread lowland relative. *Natrix olivaceus* is dwarfed in the colder climate of the rain forest and *Crotaphopeltis hotamboeia tornieri* has a reduced number of scalerows as compared with the savannah race; it may be that these two forms are later adaptations to forest life at high altitudes recently developed from the widespread savannah stock and not an integral part of the supposedly primitive forest-dwelling fauna. What is true of *Natrix* and *Crotaphopeltis* as to their having lowland relatives applies to most of the other ophidian genera associated with the rain forest; only two, or at most three, genera (*Geodipsas*, *Miodon* and *Atheris*) are exclusively forest-dwelling as regards all their species. One of these — *Geodipsas* — is possibly an unnatural assemblage of forms as it embraces Malagasy and mainland species, the only other colubrine genus with a similar distribution being the ancient and widespread *Natrix*. When we come to consider the species we find that only four (or 22%) are common to the forested regions of East and West Africa while no fewer than eleven species (or 61%) are endemic and nine (50%) of these are known only from the Uluguru and Usambara Mountains.

Of the lizards, only one, a burrowing type, is common to both Uluguru and southwestern highlands; this skink (*Melanoseps*) has been taken at a low altitude (Mkata Station) but in a surviving belt of gallery forest on the banks of a permanent river which suggests a possible means of later dispersal. Two species (or 18%) are common to West Africa; half-a-dozen are only known from African forests east of, and including, Ruwenzori; two (or 18%) are confined to the Uluguru and Usambara ranges, these endemic forms are skinks of the genus *Scelotes* which burrow in the rich leaf mould and the debris of decaying trees.

The slow-moving chameleons have been particularly susceptible to speciation and no form is common to the Uluguru and the southern highlands. In addition it might be remarked that all sixteen forms (or 100%) are confined to East Africa, none being known from the West coast, furthermore eight (or 50%) are restricted to the Uluguru-Usambara and associated mountains and eight to the southern and southwestern highlands. In the case of chameleons it has not been possible to adhere so strictly to a division as between forest and non-forest forms for in life few of these reptiles actually live in forest glades but are most abundant in the low trees and bush surrounding the forest; many live in the uplands quite independently of forests but none of those listed occur at low altitudes with the exception of *C. melleri*.

*Arifauna Associated with the  
Mountain Rain Forest*

	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga Mtns.	Rungwe Mtn.	Poroto Mtns.
<i>Stephanoaëtus coronatus</i> .....	L		L		L	
<i>Buteo oreophilus</i> .....	L		L			
<i>Francolinus squamatus usambaricus</i> .....	L					
<i>Francolinus squamatus uzungwensis</i> .....			L			
<i>Sarothrura elegans languens</i> .....		L				
<i>Sarothrura rufa elizabethae</i> .....	?	L				
<i>Sarothrura sp.</i> .....			L			
<i>Columba arquatrix arquatrix</i> .....	L	L	L		L	
<i>Turturoena delegorguei sharpei</i> .....	L	L				
<i>Turtur afer kilimensis</i> .....	L	L				
<i>Aplopelia larvata larvata</i> .....		L			L	
<i>Cercocecyx montanus patulus</i> .....	M	L				
<i>Turacus livingstonii cabanisi</i> .....		L	L			
<i>Turacus livingstonii livingstonii</i> .....				L	L	L
<i>Turacus fischeri</i> .....	L					
<i>Turacus hartlaubi</i> .....	L					
<i>Bycanistes buccinator</i> .....	L	L				
<i>Bycanistes cristatus brevis</i> .....	L	L	L	L	L	
<i>Apaloderma narina narina</i> .....		L				
<i>Heterotrogon vittatum vittatum</i> .....	L	L		L	L	
<i>Buccanodon leucotis kilimensis</i> .....	L	L				
<i>Buccanodon olivaceum olivaceum</i> .....	L	L		L	L	L
<i>Protodiscus insignis reichenowi</i> .....	L					
<i>Mesopicos griseocephalus kilimensis</i> .....		L				
<i>Mesopicos griseocephalus ruwenzori</i> .....			L			
<i>Smithornis capensis suahelicus</i> .....		L			?	
<i>Motacilla clara</i> .....	L	L		L	L	
<i>Illadopsis rufipennis distans</i> .....	L					
<i>Illadopsis stictigula stictigula</i> .....	L	L				
<i>Illadopsis stictigula pressa</i> .....			L	L	L	
<i>Pseudoalcippe abyssinicus abyssinicus</i> .....	L					
<i>Pseudoalcippe abyssinicus stierlingi</i> .....		L	L		L	L
<i>Suaheioriornis kretschmeri kretschmeri</i> .....	L	S				
<i>Phyllastrephus terrestris suahelicus</i> .....		L				
<i>Phyllastrephus flavostriatus flavostriatus</i> ..	L	L				
<i>Phyllastrephus rabai</i> .....	L					
<i>Phyllastrephus fischeri placidus</i> .....		L	L		L	L
<i>Phyllastrephus cerviniventris</i> .....		L				

L = Collected by Loveridge.

M = Collected by Moreau.

S = Recorded by Sclater.

	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga Mtns.	Rungwe Mtn.	Poroto Mtns.
<i>Arizelocichla nigriceps percivali</i> . . . . .	L					
<i>Arizelocichla nigriceps neumanni</i> . . . . .		L				
<i>Arizelocichla nigriceps fusciceps</i> . . . . .					L	L
<i>Arizelocichla tephrolaema usambarae</i> . . . . .	L					
<i>Arizelocichla milanjensis striifacies</i> . . . . .	L	L	L		L	
<i>Arizelocichla masukensis roehli</i> . . . . .	L	L				
<i>Arizelocichla masukensis masukensis</i> . . . . .			L	L	L	
<i>Arizelocichla chlorigula</i> . . . . .		S	L	L		
<i>Chlorocichla flaviventris centralis</i> . . . . .	L	L				
<i>Andropadus insularis insularis</i> . . . . .		L				
<i>Eurillas virens virens</i> . . . . .	L	L			L	
<i>Alseonax adustus fülleborni</i> . . . . .	L	L	L	L	L	
<i>Alseonax minimus roehli</i> . . . . .	S					
<i>Dioptrornis fischeri amani</i> . . . . .	M					
<i>Dioptrornis nyikensis</i> . . . . .			L		L	L
<i>Batis mixta</i> . . . . .	L	L	L	L	L	L
<i>Batis minor nyanzae</i> . . . . .		L				
<i>Batis molitor soror</i> . . . . .		L				
<i>Platystira peltata peltata</i> . . . . .		L				L
<i>Trochocercus bivittatus</i> . . . . .		L				
<i>Trochocercus albonotatus subcaeruleus</i> . . . . .	L	L	L		L	L
<i>Turdus libyanus tropicalis</i> . . . . .		L				
<i>Turdus olivaceus roehli</i> . . . . .	L					
<i>Turdus olivaceus uluguru</i> . . . . .		L				
<i>Turdus olivaceus nyikae</i> . . . . .			L		L	S
<i>Turdus gurneyi usambarae</i> . . . . .	S	L				
<i>Turdus gurneyi otomitra</i> . . . . .				L		
<i>Cossypha heuglini intermedia</i> . . . . .	L	L				
<i>Cossypha natalensis</i> . . . . .	L	L				
<i>Cossypha caffra iolema</i> . . . . .	L	L	L	L		L
<i>Bessornis albigularis albigularis</i> . . . . .		L				
<i>Bessornis albigularis porotoensis</i> . . . . .					L	L
<i>Sheppardia cyornithopsis bangsi</i> . . . . .		L				
<i>Sheppardia cyornithopsis sharpei</i> . . . . .					L	S
<i>Alethe fülleborni fülleborni</i> . . . . .				L	L	
<i>Alethe fülleborni usambarae</i> . . . . .	S	L				
<i>Alethe anomala montana</i> . . . . .	S					
<i>Alethe macelounii</i> . . . . .						S
<i>Pogonocichla stellata orientalis</i> . . . . .	L	L				

L = Collected by Loveridge.

M = Collected by Moreau.

S = Recorded by Sclater.



	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga Mtns.	Rungwe Mtn.	Poroto Mtns.
<i>Pogonocichla stellata johnstoni</i> . . . . .			L	L	L	L
<i>Seicercus ruficapilla minulla</i> . . . . .	L	L				
<i>Seicercus ruficapilla johnstoni</i> . . . . .					L	L
<i>Bradypterus usambarae</i> . . . . .	S	L	L	L	L	L
<i>Apalis thoracica uluguru</i> . . . . .		L				
<i>Apalis thoracica interjectiva</i> . . . . .			L			
<i>Apalis thoracica murina</i> . . . . .				L	L	L
<i>Apalis moreaui</i> . . . . .	L					
<i>Apalis alticola</i> . . . . .				L	L	
<i>Apalis flavida golzi</i> . . . . .		L				
<i>Apalis flavida niassae</i> . . . . .					S	
<i>Apalis chapini</i> . . . . .		L	L			
<i>Altisornis ruficeps ruficeps</i> . . . . .	S					
<i>Altisornis ruficeps altus</i> . . . . .		L				
<i>Campephaga flava</i> (incl. <i>nigra</i> & <i>hartlaubi</i> ) . . . . .	L	L				
<i>Campephaga quiscalina munzneri</i> . . . . .		L				
<i>Chlorophoneus rubiginosus munzneri</i> . . . . .	L	L				
<i>Chlorophoneus nigrescens</i> . . . . .	M					
<i>Chlorophoneus nigrifrons nigrifrons</i> . . . . .	L	L				
<i>Chlorophoneus nigrifrons manningi</i> . . . . .				L		L
<i>Chlorophoneus quadricolor intercedens</i> . . . . .		L				
<i>Malaconotus alius</i> . . . . .		L				
<i>Onychognathus walleri walleri</i> . . . . .	L	L				
<i>Onychognathus walleri nyasae</i> . . . . .			L	L	L	
<i>Onychognathus morio shelleyi</i> . . . . .	L	L		L		
<i>Onychognathus tenuirostris</i> . . . . .		L	L			
<i>Stilbopsar kenricki</i> . . . . .	L	L				
<i>Zosterops virens usambarae</i> . . . . .	L	L				
<i>Zosterops virens stierlingi</i> . . . . .			L	L		
<i>Zosterops virens sarmenticia</i> . . . . .					L	L
<i>Cinnyris mediocris usambarae</i> . . . . .	L					
<i>Cinnyris mediocris fülleborni</i> . . . . .			L	L	L	L
<i>Cinnyris loveridgei</i> . . . . .		L				
<i>Spermophaga ruficapilla cana</i> . . . . .	L					
<i>Cryptospiza reichenowi ocularius</i> . . . . .		L	L	L		L
<i>Pirenestes minor minor</i> and <i>frommi</i> . . . . .		L				
<i>Linurgus kilimensis kilimensis</i> . . . . .		L				
<i>Linurgus kilimensis rungwensis</i> . . . . .					L	L
TOTALS . . .	56	69	29	23	34	23

L = Collected by Loveridge.

M = Collected by Moreau.

S = Recorded by Slater.

In the case of the birds I have been able to augment the records of my own collecting by some communicated to me by Mr. R. E. Moreau and a dozen mentioned by Sclater in his *Systema Avium Aethiopicarum* which publication has been of the greatest assistance to me in the compilation of the above list. By the exclusion of most of the non-passerines and a great many upland species the list of birds collected in these mountains has been reduced to half.

An examination of the foregoing list shows that birds are more widely distributed than any other group of vertebrates considered, but that many species have been so long separated from their allies on other ranges that they have split up into well-defined races. If Kilimanjaro were included it would be seen that more than a dozen forms occur there which are represented by a different subspecies in the Usambara though over a score of forms are common to both Kilimanjaro and the Usambaras. Undoubtedly when more collecting has been done on the latter range the number of forest species will be in excess of those to be found on the Uluguru.

The futility of expecting much assistance from a study of the avifauna is exemplified by the fact that all except four (i. e. 93%) of the fifty-two genera listed above, are common to West Africa though not necessarily to the mountains for many occur in lowland forest. Of these four, two (*Pogonocichla* and *Stilbopsar*) occur also in the mountains of the Central Lake Region, leaving only *Suaheliornis* and *Artisornis* as endemic East African genera. The recently proposed *Artisornis* was considered by Sclater to be synonymous with *Apalis*; if this view be taken then *Suaheliornis* remains as the sole genus confined to the mountain rain forests of East Africa.

*Mammalian Fauna Associated with  
the Mountain Rain Forest*

	Usambara Mtns.	Uluguru Mtns.	Usungwe Mtns.	Ukinga Mtns.	Rungwe Mtn.	Poroto Mtns.
Rhynchocyon cirnei hendersoni.....			L		L	?
Rhinonax petersi petersi.....	L	L			S	
Petrodromus sultan sultan.....	L		L			
Petrodromus nigriseta.....		L				
Crocidura martiensseni.....	T	L				
Crocidura bicolor elgonius.....		L				
Crocidura monax.....		L				
Crocidura maurisca geata.....		L				
Chlorotalpa tropicalis.....		L				
Chlorotalpa stuhlmanni.....			L	L	L	
Nandinia binotata arborea.....		L		L	L	
Bdeogale crassicauda omnivora.....	L	S				
Cercopithecus leucampyx monoides.....	L	L				
Cercopithecus leucampyx moloneyi.....			L	L	L	S
Colobus polykomos palliatus.....	L	L				
Colobus polykomos sharpei.....			S	L	S	S
Colobus badius gordonorum.....			L			
Anomalurus orientalis.....	L	L			?	
Heliosciurus undulatus undulatus.....	L		L			
Heliosciurus mutabilis shirensis.....				L	L	L
Funisciurus vexillarius.....	L					
Aethosciurus byatti byatti.....	L	L	L			
Aethosciurus byatti laetus subsp. n. ....				L		
Aethosciurus lucifer.....					L	
Dendromus mesomelas nyasae.....		L		L	L	?
Praomys tullbergi delectorum.....		L				
Praomys tullbergi melanonotus subsp. n. . .			L	L	L	L
Hylomyseus weileri.....		L	L	L		
Cricetomys gambianus osgoodi.....	L	L				
Cricetomys gambianus viator.....				?	L	
Lophuromys aquilus aquilus.....	L	L	L	L	L	L
Lophuromys sikapusi ansorgei.....					L	
Claviglis murinus isolatus.....			L			
Claviglis soleatus collaris subsp. n.....				L		
Cephalophus harveyi harveyi.....	L	L				
Cephalophus melanorheus schusteri.....	L	L				
Cephalophus melanorheus lugens.....				S	L	
Nesotragus moschatus moschatus.....	L	L				
Dendrohyrax terricola terricola.....	L					
Dendrohyrax terricola schusteri.....		L				
Heterohyrax lademanni.....				T	L	
TOTALS...	16	22	12	14	16	7

L = Collected by Loveridge.

S = Seen, but not collected.

T = Type locality.

Of mammals the only species taken in every range was a rat (*Lophuromys a. aquilus*) which, though usually found at the forest edge, undoubtedly adapts itself to bush life and a more generalized upland distribution. Of a dozen species common to both the Uluguru and Usambara Mountains, nine (or 75%) were not found in the southwestern highlands: on the other hand, fifteen (or 62%) of the twenty-four forms occurring in the southwestern highlands were not taken in the more northern mountains. The distribution is interesting as showing a less marked tendency to division between the faunae of the two areas than was found to be the case with the amphibians and reptiles. Undoubtedly mammals, owing to their ability to withstand climatic changes and their greater migratory powers, have presumably spread since conditions supervened which were inimical to further reptilian dispersal.

When we consider the twenty-three mammalian genera listed above, we find that sixteen (or 69%) are common to West Africa and only five (or 21%) are endemic in East Africa: the remaining two (or 8%) extend their range to the mountains of the Central Lake Region where, as with the reptiles, we find species common to the more eastern rain forests. Few, if any, mammalian species associated with the eastern forests, extend their range to the west coast without splitting up into races.

#### CONCLUSIONS AND SUMMARY

Any conclusions as to the present day distribution of vertebrate life must be based on considerations of climate and environment which in turn involves taking into account the geological history of the area which is being studied. Fortunately much of the route traveled had been covered only the year before by Dr. Bailey Willis, as Research Associate of the Carnegie Institute of Washington, and whose work "Living Africa" (1930) touches on the geology of the region under consideration.

Dr. Willis believes that: "In Mesozoic time Africa was a great plain that sloped very gently to sea level. The climate was monotonously tropical within the tropics and nowhere modified locally by heights that concentrate rainfall. Rivers meandered sluggishly in courses that are now lost." Then lifting force was exerted, warping the old plain and elevating some areas more than others, such unequal elevation resulting in the formation of escarpments by rupturing the surface; he cites the Iringa Highlands as an example of such warping,

the whole plateau having been raised 3,000 feet. Naturally such processes were extremely slow.

There is good evidence for the belief that at one time forest extended over much of tropical Africa, indeed Meinertzhagen (1930) referring to the remains of fossil trees in Egypt where no forest exists today, draws the following picture of the first Pluvial period in Egypt which "terminated about 370,000 years ago and during that period Northern Africa must have had a huge rainfall and would have been a most disagreeable country for residence. Vast forests must have clothed the desert, marshes would have filled every depression and huge rivers roared their way to the sea." (page 14.)

A vivid description of the tropical forest still existing in Tanganyika is given by a contributor to *The Handbook of Tanganyika* (1930), who writes: "The rain forest proper is confined to the mountain masses of Kilimanjaro, Meru, Usambara, Uluguru, Pare and Nguru, all in the north-east, but the mountains of Iringa and Rungwe in the south-west also have many remnants of the type. It is a wet dense mass of evergreen vegetation penetrable only with difficulty off the track. Great stems tower up through the tangled undergrowth and support an upper canopy inextricably interwoven by scandent lianas, shutting out the air and heat and light of the tropical sun. Underfoot is a thick carpet of rotting vegetation studded with fungoid growths which absorbs and holds the rainfall like a sponge and, after saturation, slowly yields it up to feed the streams issuing from the mountains and maintains their head of water well into the long drought seasons." (page 230.)

The conclusion seems inescapable that the dispersal of the amphibians, reptiles, and probably of some of the mammals inhabiting this luxuriant forest today, occurred at a remote period, possibly in the Miocene, when the forest belt was continuous from the Cameroons, through the Congo, past Elgon and Kenya to Witu on the east coast, southwards to Zanzibar (possibly to Kilwa along the coast) and inland as far as Meru, and the Usambara and Uluguru ranges. The forests of the Central Lake Region were possibly linked up with the Uganda forests lying to the north of them.

It would appear that a southward extension of forest connected the Kivu region with the Poroto Mountains and Rungwe and by this means permitted the distribution of such amphibia as *Arthroleptis adolfi-friederici*, *A. riechei*, and *A. schubotzi* to reach the southwestern highlands. Among the reptiles of that region *Atheris barbouri*, *Lygodactylus angularis*, *Brookesia platyceps* and other chameleons, though

specifically distinct, show affinities with Kivu species rather than with anything occurring upon the Usambara or Uluguru Mountains. With the mammals also, it is abundantly clear that a strong admixture of Kivu forms exists alongside a few races which are also to be found in the Usambara and Uluguru ranges.

With the destruction of the forest, the shade and surface moisture, essential to the existence of many lower vertebrates, disappeared and the forest fauna vanished together with the forest over great tracts of lowland and plateau but survived as a relic upon the mountains. It would appear that deforestation has taken place over much of the Uzungwe Mountains and resulted in changes inimical to the survival of the forest-dwelling forms. Matthews (1930) has stated: "It is to be observed that it is not the barrier that limits distribution in many instances, but the sharp diversity of climate conditioned by or associated with that barrier." (page 37.) In some portions of the Ukinga Mountains the survival of the forest and of the less progressive animal types associated with it, may be attributed to the steepness of the slopes which are at times even too precipitous to tempt a native agriculturist. Briefly then we may summarize the position as follows:

(1) We may postulate a very ancient trans-African forest connecting the Cameroon Mountains in the west with the Usambara and Uluguru ranges in the east: the Uluguru supporting the most southerly remanent of truly virgin tropical rain forest in East Africa.

(2) The vertebrates (omitting birds)' by their distribution overwhelmingly demonstrate a close connection between the Usambara and Uluguru until comparatively recent times yet sufficiently remote to have permitted the differentiation of quite a number of subspecies in the latter (or former) range.

(3) On the other hand there is little ground for visualizing a forest connection between the Uluguru and the southwestern highlands for the two groups have few species in common. Taken class by class we find that:

The Amphibian fauna of the Uluguru rain forest shows a close affinity with that of the Usambara range to the north and very little with that of the southwestern highlands. A heavy proportion of the genera (69%) are confined to East Africa and do not occur on the West Coast.

The reptiles show a similar disposition, a score of species being common to the Uluguru and Usambara and only three to the Uluguru and southwestern highlands. None of the genera are endemic in East Africa but all have West African representatives.

To a great extent the possession of flight negatives the value of any conclusions which may be drawn from the avifauna. Only two of the fifty-two genera are endemic, 93% are common to the mountains of the West Coast.

Among mammals, most of whose present day dispersal was presumably due to migrations during and since the Tertiary, the division is not so clearly cut, and until more is known of their distribution speculation is somewhat idle. Of the thirty-four *species* listed, thirteen (or 38%) are common to the Uluguru and Usambara and ten (or 29%), though as differentiated races, to the Uluguru and southwestern highlands. Of the twenty-three mammalian genera only five (or 21%) are endemic; 69% are common to West Africa.

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## EXPLANATION OF PLATES

PLATE 1

PLATE 1

MAP SHOWING THE ROUTE TAKEN

The itinerary is marked by crosses. Landing at Dar es Salaam, the author passed through Morogoro, Dodoma, Iringa, Tukuyu, Abercorn, Ujiji, Mwanza, Bukoba, Entebbe, Jinja, Nairobi and sailed from Mombasa.



**PLATE 2**

PLATE 2

GRAZING LAND SHOWING FOREST REMNANTS ON THE LOWER  
SLOPES OF RUNGWE MOUNTAIN at 2000 metres

It appears probable that most of this country has been deforested through human agency. It is rich in bird life but most of the species are wide-ranging forms, not local like those inhabiting the adjacent forest further up the mountain. (After photograph by Walther Goetze).





PLATE 3

PLATE 3

TROPICAL RAIN FOREST ON THE ULUGURU MOUNTAINS

between 1300 and 1400 metres

The evergreen tropical rain forest of East Africa supports a much richer and more varied fauna than the subtropical forests of the southwestern highlands. Only on Rungwe did the trees approach those of the tropical rain forest in magnificence and abundance. (After photograph by Walther Goetze).

